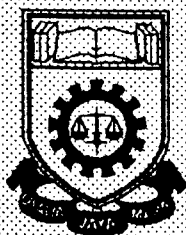


**SIMULATION OF INDUCTION MACHINE ON A PERSONEL  
COMPUTER USING TURBO C++**

**Thesis is presented in partial fulfilment for the award of the  
Advanced Diploma in Electrical Engineering of  
INSTITUT TEKNOLOGI MARA**



**AZIMAN B. ABDULLAH  
Department of Electrical Engineering  
INSTITUT TEKNOLOGI MARA  
40450 Shah Alam, Malaysia  
JUNE 1995**

## **ABSTRACT**

This project is concerned on the improvement of a computer simulation software that could be used to simulate the dynamic performance characteristics of various ratings of induction motor complete with graphical analysis display to be operated on a personal computer and can be used for educational purposes. The machine analysis uses the well known Park's form of linear equations that has been transformed into state vector matrices. The equations are solved using a number of numerical methods for purposes of studying the performance of the mathematical techniques as applied in this simulation.

## ACKNOWLEDGEMENTS

All praise be to Allah, the Beneficent, the Merciful. Thee do I worship and Thee do I beseech help. My ever-lasting thank to Allah for granting me patience in completing this project.

I am obliged and grateful to Mr. Mustafar Kamal Hamzah (Project Advisor) for his comments and ideas behind this project, without him, this project probably would not have been successful .

I am indebted to Mr. Kamal Zuhairi Zamli for letting me to use some of his PASCAL and C routines and were most accommodating when approached for advice and information and willingly give his ideas and suggestion for carrying out this project.

I also would like to thank to Mrs. Peridah Bahari , mathematics lecturer who guide me and explain about Numerical analysis (Runge-Kutta method) which is one of the important sources of this programming.

Special thanks to numerous friends and classmate for their understanding and made important contributions to the completion of this thesis.

# SIMULATION OF INDUCTION MACHINE ON A PERSONEL COMPUTER USING TURBO C++

<u>CONTENTS</u>		<u>Page No</u>
	Abstract	i
	Acknowledgement	ii
	Contents	iii
1.0	Introduction	1
2.0	Project Description	5
3.0	Mathematical Equation	7
3.1	Variation of Impedance with Speed	11
3.2	Parameter Determination	11
3.3	Numerical Methods	12
4.0	Software Features	18
4.1	Program Input	18
4.2	Type of Simulation	19
4.3	Program Output	20
4.4	Real Time Simulation	20
4.5	Program Structure	21
5.0	Manual for Induction Machine Software (IMSS)	30
5.1	Getting Started	30
5.2	Summary of Commands for IMSS	31
5.3	Common Errors of IMSS	32
6.0	Analysis	34
6.1	Accuracy and Solution Time	35
6.2	Conclusion of Analysis	37
7.0	Result	38
8.0	Conclusions	55
	References	57

# CHAPTER 1

## 1.0 INTRODUCTION

Induction machines are used for many industrial drives where simple, reliable and robust machines is the first requirement and where the use of non-synchronous speed drives is of no disadvantage. The popularity of these machines are apparent due to those features resulting in a world market share of 85% and are manufactured in sizes ranging from a few watts to around 10 MVA[1].

The stator of an induction motor is similar to that of the synchronous motor but the rotor structure is different. Induction machine rotors are of two types, wound rotor and squirrel cage rotor. In either case, the rotor windings are contained in slots in a laminated iron core which is mounted on the shaft. In small machines, the rotor lamination stack is pressed directly on the shaft. In larger machines, the core is mechanically connected to the shaft through a set of spokes called a spider.

The winding of a wound rotor is a polyphase winding consisting of coils placed in slots in the rotor core. It is also quite similar to the stator winding of synchronous machine. It is almost always three phase, and connected in Y. The three terminal leads are brought to slip rings mounted on the shaft. Carbon brushes riding on these slip rings are shorted together for normal operation. Wound rotor are usually used only in large machines. External resistance are